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A portion of the panel of the Fourth Annual Junior Scientists Assembly. Members listen as Robert Beck of the Bronx High School of Science explains his science research project. (See page 28.)

IN THIS ISSUE

Procedures for Staining Plant Chromosomes - - - 13
President's Page - - - - - 16
The Directors Meet - - - 17
Membership News and Notes 18
Suggestions for Teaching Electronics - - - - - 20
Audio-Visual Teaching Aids in a Science Curriculum - 22
Science Awards and Scholarships - - - - - 24
Chats with Science Teachers—VIII - - - - 26
Fourth Annual Junior Scientists' Assembly - - 28
"Learning" Tours for Chemistry Students - - - 32
Book Shelf - - - - - - - 45
News and Announcements - 48

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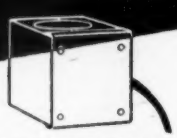

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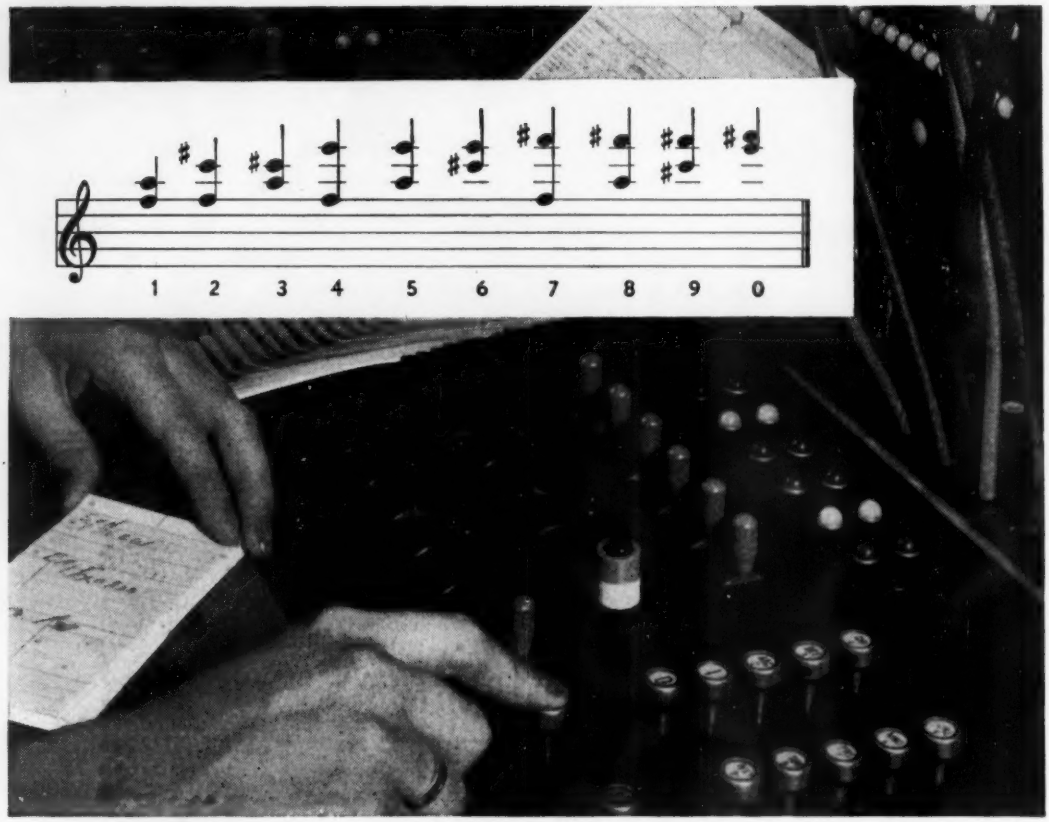

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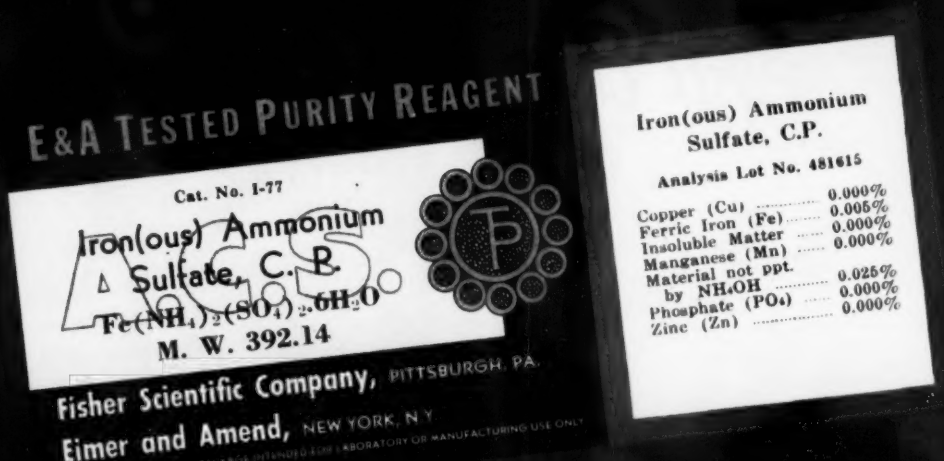
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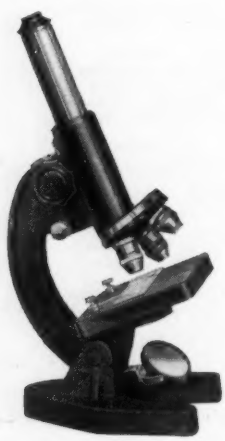

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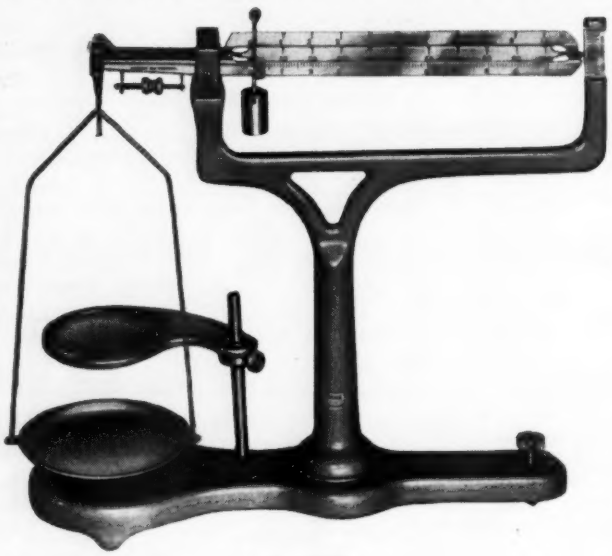

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VOLUME XVII FEBRUARY, 1950 NUMBER 1

Procedures for Staining Plant Chromosomes

WILSON N. STEWART

Assistant Professor
Department of Botany
University of Illinois

Introduction

THE STUDY of plant and animal chromosomes, their formation, behavior, and significance, is a topic of biology whose understanding often eludes the high school student as well as the college freshman. It is apparent that such an understanding is needed by every student as the sciences of plant and animal breeding, genetics, and eugenics are based on the activities of chromosomes and the factors or genes which they carry.

The usual classroom presentation of this topic is to explain the process of mitosis from a prepared chart and then give the student a slide of some plant or animal tissue which has been killed, sectioned, and stained. From this he is supposed to reconstruct the "stages" through which a nucleus must pass in the formation of daughter nuclei. The interpretation of the "stages" of mitosis from prepared slides is often difficult, for in most cases the division figures are incomplete since they have been sectioned in the processing of the slide. Furthermore, the stains used cause the chromosomes to appear opaque and little of their internal structure can be determined.

The so-called smear and squash technics, which have been developed within the last 25 years, enable cytologists to make quick chromosome studies of plants and animals grown in the laboratory. These preparations are advantageous in that the students can *see* from what part of the organism the tissues to be studied originate; he can make the preparation himself in a matter of a few minutes with a limited amount of equipment, and finally he can see the results of his efforts in the form of division figures in all "stages" whose sets of chromosomes are complete and whose individual chromosomes show internal structure. Such an approach to the study of chromosomes has proved a valuable adjunct to the understanding of their significance.

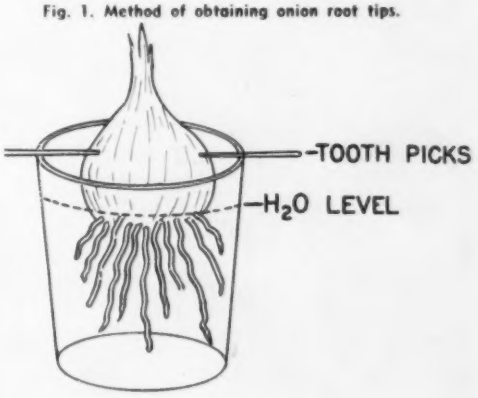
Growing the Plant Material

Probably the most usable material for accomplishing the technics to be described is the root tips produced by the bulb of the common white onion. These bulbs can be obtained from nearly any grocery store. This material is desirable because it requires a minimum of care; the roots are produced in a short time and in great abundance. In addition, the chromosomes found in the root tips are large and easily stained.

The onion bulbs should be suspended in a glass of water so that only the root producing portion of the bulb is submerged. To suspend the bulb, toothpicks are inserted laterally into the bulb and these in turn rest on the rim of the container. (See Figure 1.)

As the roots emerge from the base of the bulb and grow in length, the terminal centimeter may be cut; this is placed in a small

Fig. 1. Method of obtaining onion root tips.



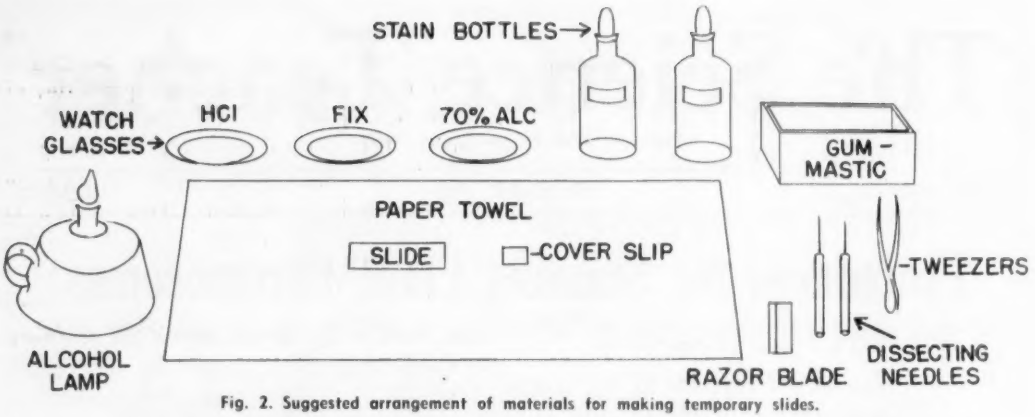


Fig. 2. Suggested arrangement of materials for making temporary slides.

vial containing a killing and preserving agent. The latter consists of 3 parts of 95 per cent ethyl alcohol and 1 part of glacial acetic acid. Fixation of the root tips in this solution should be allowed to proceed for 2 or 3 days. After this period the roots may be removed from the fixing agent and stored indefinitely in 70 per cent alcohol.

Other Materials

SEVERAL stains have been used in making smear preparations of mitoses. The one most widely used is acetocarmine which is a combination of acetic acid and carmine dye.[1] This stain is prepared by boiling an excess of carmine in 45 per cent acetic acid (about ½ gram of stain in 100 ml of acetic acid) for 2 to 10 minutes. After cooling, the acetocarmine is filtered and may be used full strength.

1—This dye can be obtained from the Coleman and Bell Co., Norwood, Ohio.

Fig. 3. Onion root tip cells stained with brilliant cresyl blue. x450.

It is more or less a matter of luck when a good batch of stain is obtained and one continues to make stain until the product gives good results.

The second stain, brilliant cresyl blue,[2] gives a yellow-brown color to the chromosomes in contrast to the red color imparted to them by acetocarmine. Brilliant cresyl blue has the advantage of being more rapidly prepared than acetocarmine and the batch of stain is good with the first try. The stain is made by mixing 2 per cent brilliant cresyl blue in 45 per cent aqueous acetic acid. No other treatment is required.

The stains should be prepared ahead of time and placed in small dropper bottles. Other materials that will be needed are paper towels, used Gem razor blades, an alcohol lamp, wire dissecting needles, watch glasses, forceps, clean 1 x 3 inch slides, clean No. 1 cover slips, 70 per cent ethyl alcohol, macerating fluid consisting of 1 part of concentrated HCl and one part of 95 per cent ethyl alcohol, and a mixture of gum-mastic and hard paraffin. The latter is made by melting equal parts of gum-mastic and hard paraffin together in a metal container. These are then mixed and the mixture is allowed to harden. A suggested set-up for the easy-to-get materials listed above is shown in Figure 2.

Making the Smear

IF BRILLIANT cresyl blue is used as the stain, the procedures outlined below should be allowed for making the smears of the previously fixed onion root tips.

2—This dye can be obtained from the Coleman and Bell Co., Norwood, Ohio.

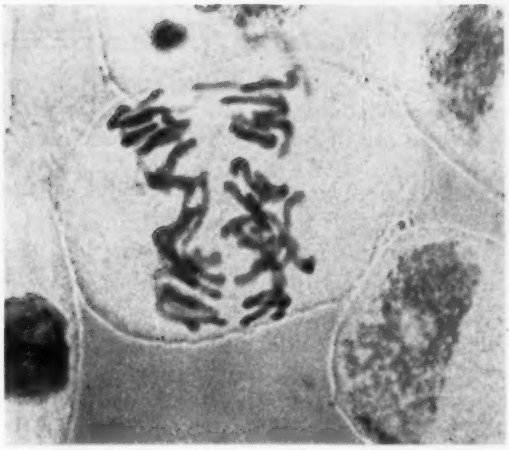


Fig. 4. Onion root tip cell at anaphase. Stained with brilliant cresyl blue. x800.

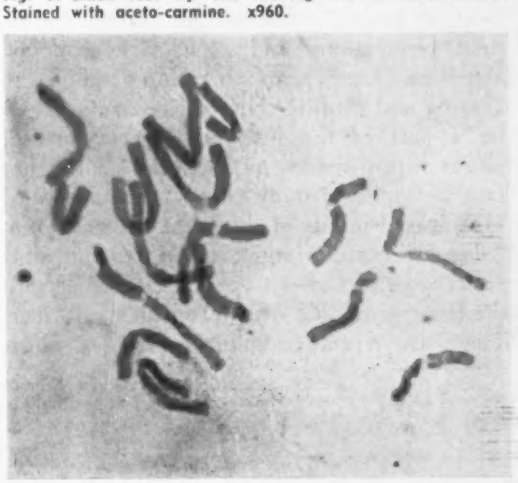
1. Place the root tip in a watch glass containing the macerating fluid (1 part of concentrated HCl and 1 part of 95 per cent ethyl alcohol). The maceration should be complete at the end of 3 to 5 minutes. Maceration of the root tip effects the easy separation of the cells when they are squashed on the slide.
2. Transfer the root tip to a watch glass containing some of the fixing agent (1 part of glacial acetic acid and 2 parts of 95 per cent ethyl alcohol). Remove the root tip from this solution after a period of 2 to 3 minutes.
3. Now place the tip in a watch glass containing 70 per cent alcohol for 2 to 3 minutes.
4. Place a *small* drop of the stain on the surface of a clean 1 x 3 inch slide. Remove the root tip from the 70 per cent alcohol and with the razor blade cut cross-sections from the terminal millimeter of the embryonic region. Push these into the stain.
5. Allow the staining process to go on for 3 to 5 minutes, using the edge of the razor blade during the interval to separate the cells further. At the end of 3 minutes examine the cells which accumulate at the edge of the drop of stain with the low power of the microscope.
6. If the proper degree of staining has been achieved apply a clean cover slip and remove the excess stain from its margins with a paper towel. Now cover the slide with the paper towel and apply direct thumb pressure on the area of the cover slip, being careful not to let the cover slip move. Remove the towel and add small quantities of stain to replace air bubbles which are formed between the slide and cover slip.
7. Seal the edges of the cover slip with the gum-mastic hard paraffin mixture. This is done by heating one of the needles in the flame of the alcohol lamp, dipping the hot needle into the gum-mastic so that a small quantity melts. Apply the melted material to the edges of the cover slip with the needle. This air-tight coating prevents excessive drying of the temporary slide.

THE NUCLEI and division figures can be observed with the highest power of the microscope. If the slide has been well made the cells should be flattened and somewhat separated from one another. The chromatin of the "resting" nuclei shows a striking affinity for the stain in contrast to the nucleoli which do not stain at all. (See Figure 3.) Chromosomes may retain a degree of translucency after staining which reveals their structure at various stages of division. These nuclear structures are stained yellow-brown while the cytoplasm remains colorless. (See Figures 3 and 4.) In temporary slides the colorless cells with their dark staining nuclei and chromosomes appear in sharp contrast against a blue background.

If acetocarmine is used, the following schedule should be observed:

Continued on Page 39

Fig. 5. Onion root tip cell showing the 16 chromosomes. Stained with aceto-carmine. x960.



President's Page — By Nathan A. Neal

"Facts, concepts, and principles are functional only if they are used. We learn to use them effectively by *using* them and in no other way. Their use is in helping to solve our problems. It follows that the practical way to acquire functional understanding of facts, concepts, and principles is in connection with problem solving. Since so many of man's problems are related to the subject matter of biology, the biology class seems a particularly appropriate place to deal with them on the high school level."*

THE preceding quotation, even when removed from its context, presents a challenge to all of us who are concerned with the teaching of biology. Biology has meaning for the pupil when it relates to his personal problems and experiences. In the long view the subject is significant to the extent that it leads to the better solution of human problems. What are some of these problems? Obtaining an adequate supply of pure drinking water may be an appropriate problem for discussion in biology classes in a given locality but not suitable elsewhere if no such problem exists. Obligations to avoid contracting or spreading epidemic diseases may form the basis of a functional biology lesson if a real problem in this area exists in the immediate experience of the pupils. In a similar way, functional biology teaching may be concerned with a variety of current and local problems in the field of health, conservation, safety, recreation, occupations and even socio-economic activities. Long term operation methods in grazing and wildlife conservation can scarcely be a part of the immediate experience of pupils in an eastern metropolitan center, but may be topics of daily conversation for rural high school pupils of the great plains region. Adequate exercise and exposure to the ultra violet rays of the sun are not problems with the latter group but often are with the former. These are minute examples of topics which may be functional or otherwise in terms of the disparity of human circumstance.

IT MAY also be argued that biology should lead the pupil from personal things, which touch him closely—his own observations and activities, his own health and that of his close associates, his own safety and recreation—to his opportunities and responsibilities in community cooperation for the improvement of medical, hospital, and home health facilities, traffic and playground safety and the like. In addition there are recurring problems of living which all of us face. The subject matter which relates to these common problems may well be the framework around which discussion of functional interest is built. Such recurring problems appear in fields like nutrition, consumership, understanding of the relative importance of heredity and environment, getting along with people and applying the methods of science to the difficulties of everyday living.

These somewhat random and disorganized thoughts on the teaching of biology are not intended to deny the importance of textbooks, laboratory exercises, traditional content and evaluation of results through devices which require the use of pencil and paper. Many of the traditional procedures, techniques and activities and much of the content which has been recognized as standard in the past must remain in all good biology teaching. Selected classes of gifted pupils may even carry out research projects as a part of their classroom work. Any effective teaching program should be flexible enough to provide stimulus for the entire range of individuals concerned. Interest must be aroused where there is none and nurtured when it exists if optimum results are to be achieved. However, recognizing all of this, there remains a challenge to biology teachers to exert themselves to the effect that their work may be more functional in the lives of the pupils than is usually the case today. Biology, as all education, should be concerned with the recognizable needs and interests of the learner.

*Gordon Manzer, *Science Education in American Schools*, National Society for the Study of Education, Forty-sixth Yearbook, Part I, page 187.

The Directors Meet

HANOR A. WEBB
Secretary of NSTA

THE officers and directors of the National Science Teachers Association (NSTA) held two business sessions during the meetings of the Science Teaching Societies affiliated with the American Association for the Advancement of Science (AAAS) in New York City, December 27-30, 1949. At the first session, held Tuesday evening, December 27, in the Hotel New Yorker, thirty-six members and guests were present, including a quorum of the directors.

A concise summary of the more important reports, proposals, and actions follows:

The United Nations Conference on Conservation and Utilization of World Resources was described by NSTA's official delegate, Mr. Alexander Joseph of the High School of Science, New York City. He reported that a world population of three billion people is expected in a few decades. Food supply will be the chief factor of the standard of living, and indeed of survival. Even today the world in general is poorly fed. He described various activities intended to increase the food supply, such as a high-protein yeast having a thousand times the efficiency of a cow in converting carbohydrates to proteins.

The Treasurer's Report, as of November 30, presented by Mr. Elbert C. Weaver of Phillips Academy, Andover, Massachusetts, showed for the General Account a June 1 balance of $6,589.19; income from memberships, etc., of $5,793.61; gifts (chiefly from the National Education Association) and miscellaneous income of $8,183.19; total receipts, $20,565.99. The disbursements from the General Fund for the period were $10,884.61, leaving a December 1 balance of $9,681.38, a net gain for the year of $3,092.19.

The accounts of the Advisory Council on Industry-Science Teaching Relations showed a June 1 balance of $7,808.30; grants of $212.50, a total of $8,020.80. The expenses of the Council were $1,404.10, leaving a December 1 balance of $6,616.70.

The accounts of the Packet Service showed a June 1 deficit of $644.47; receipts of $3,832.31; expenditures of $8,606.16; a December deficit of $4,773.85; and a net increase in the deficit of $4,129.38.

NEW plans for operating the packet service under Mr. Carleton's supervision were discussed. These plans will be explained and the advice of industrial representatives will be invited at a meeting of the Advisory Council on Industry-Science Teaching Relations, scheduled for February 25 in Atlantic City.

Mr. Maurice U. Ames, of the William Niles Junior High School, New York City, reported the results of a questionnaire on NSTA dues which was sent to members several months ago. The general conclusions from the returns favored (a) moderately increased dues; (b) retention of low student membership dues; (c) an earnest membership drive. (The recommended new schedule of dues will be voted on by the membership as one item in the revision of the Governing Rules of the Association.)

Mr. Ralph Lefler of Purdue University, Lafayette, Indiana, reported on the preparation and distribution of the program for the New York meeting of the Science Teaching Societies affiliated with the AAAS. Over 20,000 of these programs were printed and distributed through the courtesy of the W. M. Welch Manufacturing Company, of Chicago. These were distributed singly, and also in bulk to some cooperating organizations. Certain plans for future meetings in 1950 (St. Louis in July, Cleveland in December) were discussed.

The illness of Miss Bertha Elizabeth Slye was reported. She has served as Director of the Packet Service since its inception. She has been compelled to retire for necessary operations on her eyes. She is still under treatment in St. Mary's Hospital, Rochester, New York. The death of Mr. Douglas B. Hobbs of the Aluminum Company of America was announced. He had been a highly valued member of the Advisory Council since its organization. Proper expressions of sympathy to Miss Slye, and to the family of Mr. Hobbs, were voted.

Interesting developments in the Nanjemoy area were reported by Mr. Philip G. Johnson

Continued on Page 34

Membership News and Notes

By ROBERT H. CARLETON, **Executive Secretary, NSTA**

IN ADDITION to magazine, packet, and bulletin services to members, NSTA provides direct assistance to teachers' groups through visitation and field work. We have been asked to report on and to summarize the extent of this activity during recent months. In addition, we shall report on highlights of the professional sessions of the recent New York City meeting.

NSTA Field Service

During the period September 1 to January 15, your Executive Secretary has represented the Association before sixteen different groups of science teachers, participating in one- and two-day meetings as speaker, consultant, or member of a panel. Additional requests to NSTA for such service have been fulfilled by various members, including Ira C. Davis (Wisconsin), Hanor A. Webb (Tennessee), and Philip Johnson (Washington, D. C.). For your information, the total cost of providing this service has been around $600. Somewhat more than $200 which has been received from the groups served as reimbursement for expenses and for professional services rendered. In all, 'the story of NSTA" and certain forms of professional help were placed directly before about 1,200 science teachers. One immediate result of these contacts consisted of signing "on the dotted line" more than 100 new members for NSTA.

Starting with a visit to the Ohio State University summer school students in science education, other stops have been made in Dayton, Ohio; Pittsburgh; Asheville; Charlottesville, Va.; Baltimore; Bangor, Maine; Huntington, W. Va.; Jackson, Miss.; Alexandria, La.; Fort Worth; Norman, Okla.; St. Louis; Detroit; Flint; and Frederick, Md. In Dayton, Flint, and Frederick, consideration of revision in science courses and curricula was the express purpose of the meetings. Elsewhere the meetings were mostly of the science sections of state education associations.

WHAT over-all impressions result from such contacts? (1) First, there is satisfying evidence that in many localities important problems of science teaching have been identified; study and experimentation in relation to these problems are under way on a high professional level.

(2) On the other hand, we must admit too many teachers among our ranks who are apathetic about these problems and their possibility of solution. What proper inference should be drawn from the fact that a professional meeting of science teachers is attended by 110 persons when there are more than 1,400 such teachers in that state?

(3) Science teaching is reaching more students and is heading in new directions in many instances. Mississippi, for example, has nearly reached its goal of two years of senior high school science for *every* pupil. New courses are being developed and explored—industrial science, general physical science, health-science, and core-science, to name a few. Science clubs, science fairs, and special opportunities for science-talented pupils enjoy increasing attention.

(4) However, there are still many handicaps to be overcome in developing an effective *program* of science education for ALL. Imagine the problems of the "science" teacher in Maine, for example, where one third of the high schools are still two-teacher schools. In Oklahoma the writer saw some of the best equipped high schools to be found anywhere; yet in this same state he visited two schools where the teacher and students were building their own laboratory tables on a budget of less than $25—not that this is necessarily *bad*, but . . .

(5) We haven't reached the point where society in general recognizes the worth of the professionally competent teacher, is ready to demand this kind of competency in the schools, and is willing to pay the price of getting—and keeping—it. In the present structure we may be getting our money's worth (?) for what we are paying the apathetic teacher. But we certainly are underpaying the really competent, professionally alert teacher. All of us have a "selling" job to do

in correcting this situation.

NEXT fall's tour of duty for your Executive Secretary begins to shape up as a midwest tour, with requests already received from groups in Illinois, Minnesota, and South Dakota. If someone from NSTA might be of help to your group, let us have an inquiry and we will explore the possibilities.

The New York City Meeting

Nearly one thousand science teachers attended sessions of the Second Cooperative Meeting of the Science Teaching Societies Affiliated with the AAAS, held at Hotel New Yorker, December 27-30, 1949. Space limitations prevent a report on all the sessions, but certain ones of particular interest to NSTA members are summarized in the following paragraphs. NSTA business sessions are reported elsewhere in this issue.

Trends in Modern Science. This first symposium sponsored by the AAAS Cooperative Committee introduced three different topics:

A. A survey of the transuranium elements and their relation to the chemistry of the rare earths, by Laurence Quill, head, Department of Chemistry, Michigan State College. The theoretical aspects of the rare earth group (lanthanides) were compared with the theoretical expectations for the transuraniums (actinides). It was shown that because of similar chemical behavior of these two groups of elements, similar methods of separation can be used and also that their spectroscopic behavior is similar.

B. The importance of the understanding of the actions of hormones was discussed by L. V. Domm, University of Chicago, who illustrated some of the experiments on sex inversion carried out by the author and his collaborators.

C. E. C. Stakman, president, AAAS, and chief, plant pathology, University of Minnesota, discussed the influence of basic research on the question of nutrition, improvement of crops, and breeding in animals due to the collaboration between the soil chemist, the geneticist, and the biochemist.

Science in General Education. The problem of science in general education exists at all levels of instruction, as pointed out by Commissioner Earl McGrath. Its importance for the education of the adolescent, as well as of the adult, was emphasized and various methods for the improvement of this type of education were discussed.

Paul B. Sears, head, Department of Botany, Oberlin, and well-known ecologist, in his address, *Concord and Science,* stressed how science can better human relations through improved science teaching. Philosophically, science interpretation of the natural world has much to offer toward a new formulation of common faiths.

Morris Meister, principal, High School of Science, New York City, in his address, *Scientific Literacy,* indicated that we are not yet scientifically literate. He also indicated how instruments could be designed to test scientific literacy and to point out to our lawmakers the tremendous importance of a scientifically literate electorate. Science, one of the mainstays for an understanding of democracy, should be better understood and more emphasized in the curriculum.

In summarizing, K. Lark-Horovitz, Purdue University and chairman of the Cooperative Committee, discussed briefly the new problems of teacher education on a broad base, the need for adequate texts, the necessity to encourage scientific education of the adult, and recurrent evaluation of the goals of the program of science in general education.

On Understanding Science as a Humanity. The scheduled speaker for this session, James B. Conant, president, Harvard University, was unable to appear because of illness. In his stead, Harlow Shapley, also of Harvard, magnanimously responded to a request to be the substitute speaker. In his address, he stressed the integrated world outlook which scientific learning engenders. He pointed out that the elaborations of scientific knowledge are based on but a few fundamentals, just as elaborate systems of finance are based on fundamental arithmetical processes. Knowledge, for example, embodied in the periodic table of chemical elements and in the electromagnetic energy spectrum is basic to all the understandings of natural phenomena and to the elaborations of applied science. An understanding of the cycle of chemical activities of the same chemical elements further enhances

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Suggestions for Teaching Electronics

ROBERT STOLLBERG

Associate Professor of Science and Science Education
San Francisco State College

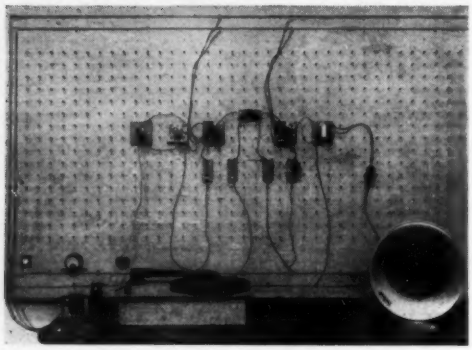
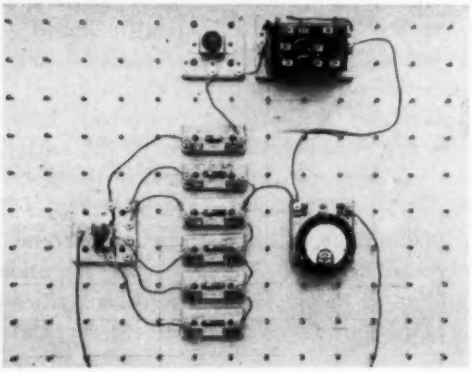


Fig. 1. A complete, working, two-stage audio amplifier assembly panel. The utility power supply is seen at the lower left.

(Second of three installments)

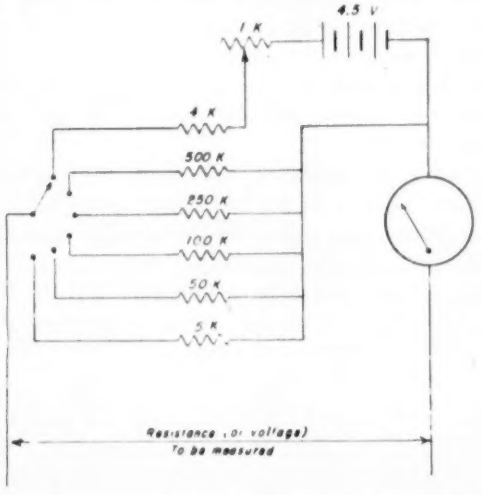
MANY successful instruction panels in the field of electronics have been designed and used. Indeed, panels for demonstration or experimentation with such circuits as power supplies, series and parallel connections, detectors, and the like have been seen or used by most teachers of physical science. It is, of course, quite true that such a panel designed specifically to illuminate one or a few principles can be very effective for these particular purposes. However, a set of such panels to illustrate even a moderate number of basic principles and circuits in electronics raises a most serious storage problem, to say nothing of the labor and cost involved in their preparation. Furthermore, students using or viewing such circuits are less apt to understand their electrical structure and logic than they would be if they could have some part in assembling the circuits. Considering these facts, it seems quite evident that a better solution to the problem can be found in a type of equipment consisting of many individual electronics units, groups of which can be assembled into whatever circuit or configuration is desired.

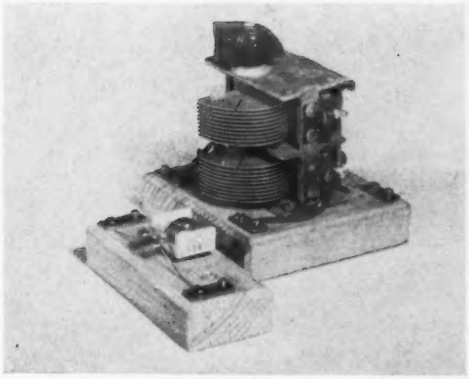
Fig. 2. This pair of illustrations of a volt-ohmmeter circuit shows how component parts can be mounted on the assembly panel to correspond closely with the appropriate schematic diagram.



Mounting Components on a Vertical Display Surface

The selection and mounting of these individual electronics components must be made with a view not only toward spreading them out on a flat work-table (for small-group experimentation), but also toward arranging them on a vertical surface (for a large-group demonstration). A suitable assembly panel for such vertical array is shown in Fig. 1. It consists of a slab of $\frac{3}{4}$ in. plywood studded with four-penny common (flat-head) nails arranged in a 2 in. square pattern. These nails have about $\frac{7}{8}$ in. of their length protruding from the panel—just enough to extend through holes in the plaques on which the individual parts are mounted and thus to give them support. In constructing this assembly panel, it is essential that the nails be placed very accurately, both in respect to





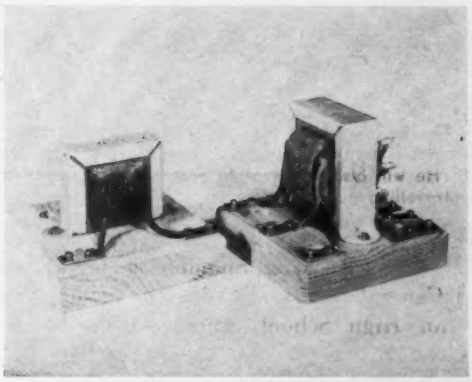


Fig. 3. Illustrated from left to right are a variable padder capacitor, a two-gang tuning capacitor wi.h trimmers, a small iron-core inductor (choke) and a small universal audio output transformer. The padder is mounted on a 1½ x 3½ in. plaque.

spacing and perpendicularity.

Preparing Plaques for Individual Parts

THE electronics components to be assembled on this vertical panel are each mounted on a wooden plaque ¾ in. thick, and either rectangular or square in shape. The most common size is 3½ in. x 3½ in., and is the smallest plaque which can be used for a vacuum tube socket and its connections. Other plaques have dimensions such as 1½ in., 3½ in., 5½ in., and 7½ in., depending on the size and shape of the component to be mounted upon it. These dimensions permit plaques to be mounted on the assembly panel with a con-

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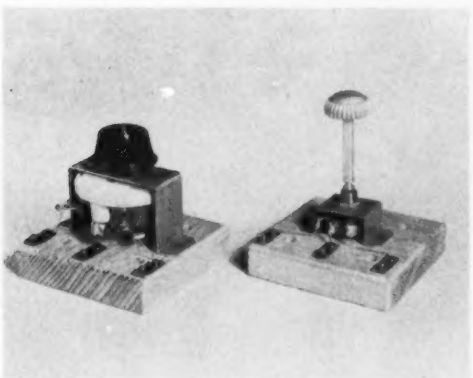


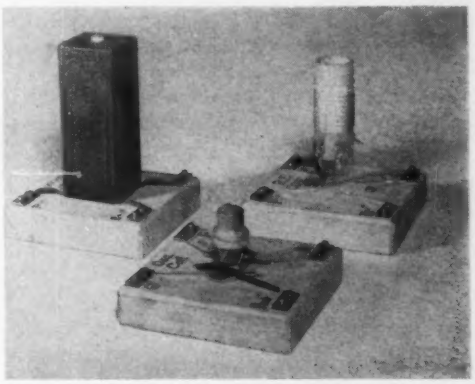
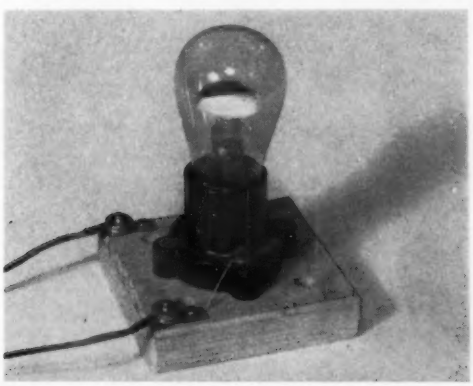
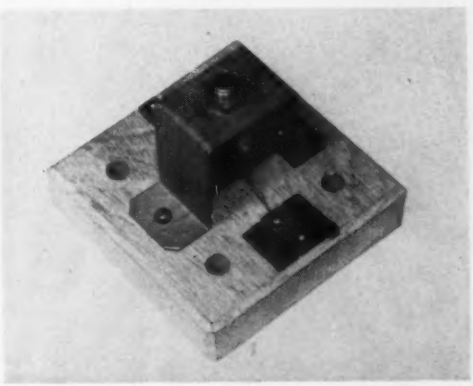


Fig. 4. (Above.) Typical potentiometers and radio-frequency components mounted on 3½ in. square plaques.

Fig. 5. The standard screw-base socket plaque below is useful for the neon-type polarity indicator illustrated, as well as for household wiring and fuse demonstrations. The phone-jack plaque (right) provides a convenient way of feeding a signal from a phonograph pick-up or an oscillator into an audio amplifier.





Audio-Visual Aids

Edited by CHARLES R. CRAKES

The editor of this department will attempt to bring before the readers of this publication the latest articles written by science teachers who are making effective use of various forms of audio-visual teaching materials. He will also endeavor to present a cross-section of educational opinions on audio-visual aids he may gather in travelling about North America.

Miss Mildred Shambo, a teacher in the General Science Department of the East Junior High School, Aurora, Illinois, has provided the article "Audio Visual Teaching Aids in a Science Curriculum."

Miss Shambo holds a BA degree from the University of Chicago and at the present time is completing work for a MA degree in science at Northwestern University, Evanston, Illinois.

In addition to this training, she has carried work at the State Teachers College at Macomb, Illinois. For the past ten years she has served as teacher in the General Science Department of the East Junior High School, Aurora, Illinois.—C. R. Crakes.

Audio-Visual Teaching Aids in a Science Curriculum

MILDRED SHAMBO

General Science Department
East Junior High School
Aurora, Illinois

AUDIO-VISUAL aids combined with good textbooks, and a competent instructor, form an unexcelled combination in teaching a science unit.

The use of audio-visual materials in the teaching of science has value for children of all ages in school. However, they extend greatly the mental vision of pupils in the junior high school classes.

Science courses that utilize only the basic text book and the laboratory manual encourage a great deal of forgetting. This method often gives rise to a distaste for science. To most students a course in general science means several units of a scientific nature to be studied in correlation with a series of experiments that have been carefully planned in advance by the instructor and then carried out by the students working under the direction of the instructor.

If our upper-intermediate grades and our secondary schools are to offer rich, meaningful science programs, we must make use of the variety of visual-aid materials that are available in the field of education today. There is a wealth of useful and inexpensive materials that will provide rich experiences for young scientists if the science teaching personnel will but organize these materials.

AUDIO-VISUAL teaching aids are all materials used in the classroom or in other teaching situations to facilitate the understanding of the written or spoken word. They may include the bulletin board, the blackboard, flat pictures, field trips, 3¼ x 4 and 2 x 2 slides, film strips, graphic materials such as maps, charts, etc., models and exhibits, school museums, and motion pictures.

In order to indicate how audio-visual aids are utilized in the teaching of science units, this article will describe their use in two units —a unit on water and one on nature study.

There are various ways in which the unit on *water* may be presented to the students in the classroom. It is possible to introduce it in such a manner that they will feel the need to know more about the compound water. Upon completion of this unit the group will have become much more aware of their environment and its effects upon their lives.

Children are encouraged to bring in newspaper or magazine articles that will serve to arouse the interest of their classmates. Articles and pictures dealing with floods, severe rainfalls, irrigation projects, erection of dams, droughts, pollution, community water supply, etc., are brought to the classroom,

used to motivate class discussions, and then arranged in an attractive bulletin board display for all to see. Since there is an opaque projector available in the science department, any flat material I would like to bring to the attention of the whole groups can be projected upon the screen in the darkened room.

Student committees are appointed at regular intervals to prepare interesting bulletin boards of flat pictures, charts, posters, newspaper and magazine articles pertaining to the subject. Materials on bulletin boards should be changed regularly and be kept up to date.

Some students compile a scrap book in which they keep a record of interesting information and pictures regarding the topic of water.

THE following motion pictures are available and interest in this unit is developed if they are shown to the classes during the introduction to this topic on *Water*.

(a) "Ground Water"—Encyclopaedia Brittannica Films, Inc., 207 S. Green Street, Chicago, Illinois—one reel, eleven minute sound film—$2.00 rental fee.

(b) "Work of Rivers"—Ideal Motion Picture Service, 28 E. 8th Street, Chicago, Illinois—one reel, eleven minute sound film—$2.00 rental fee.

(c) "The River"—General Electric Company, Publicity Dept., 1 River Road, Schenectady 5, New York—Eleven minute sound film. Free.

The following three films will clarify for the students the terms water cycle and precipitation.

(a) "Clouds Go to Work"—Edited Pictures System, Inc., 165 W. 46th Street, New York 19, New York—12 minute sound film—one reel—$2.00 rental fee.

(b) "The Water Cycle"—Encyclopaedia Brittannica Films, Inc., 207 S. Green Street, Chicago, Illinois—one reel—ten minute sound film—$2.00 rental fee.

(c) "What Makes Rain"—Young American Film, Inc., 18 E. 41st Street, New York 17, New York—one reel, ten minute sound film—$1.65 rental fee.

WHEN classes were ready to study bacterial growth in water, the film "Life in a Drop of Water" was obtained and shown. This film can be secured through rental by contacting Swank Motion Pictures, Inc.—1004 Chestnut Street, St. Louis, Missouri—one reel—twelve minutes. $2.00 rental fee.

Motion pictures and slidefilms may, by virtue of their unique characteristics, illustrate materials which cannot be seen by the naked eye, such as bacteria, plant and insect study, etc. They may be used to achieve many of the objectives of science teaching. They are in most cases the next best thing to direct experience when such experience is impossible.

One committee mounted a set of thirty illustrations to be used in connection with the opaque projector. These were 6 x 6 inches in size and were mounted on medium weight cardboard. All of the mounted pictures illustrated how "Living Things Need Water."

As a group project the students arranged a large glass terrarium to show that plants give off as well as take in water.

SEVERAL very fine field trips were arranged when the classes were ready to make a study of the local water supply. We conducted classes on a tour through the central water pumping station of this community. Groups of students were invited to visit the city laboratory and chemistry department where daily tests are made of the community water supply. These field trips provided the students with first-hand information and definite experiences in a real life situation.

Students were aware of the information they were seeking and of the follow-up discussion to be conducted upon completion of the field trip.

Several class periods were devoted to the topic of "Methods of Purifying Water." Class periods were utilized in working experiments showing filteration and the precipitation of minerals from water by the use of powdered alum. Demonstrations were conducted to show the purification of water by the settling method, distillation method, and the addition of halizone tablets to the amounts of drinking water.

Several of the boys in the class who excel

Continued on Page 40

Honorary Science Award, cast in bronze, after a drawing by Walter Dorwin Teague, noted designer. It is presented to leading science students in more than 5,000 high schools in the United States and its possessions.

Science Awards and Scholarships

M. H. EISENHART

President
Bausch & Lomb Optical Company

THE office of Charles Dalton, Director of Admissions at the University of Rochester, is normally a busy place, with complicating peaks of activity during periods of the year when high school seniors become suddenly serious about going to college. This Spring, one of these eruptions of student interest will occur on or before March 10th when an estimated five or six hundred students will submit applications placing them in competition with each other for the annual science scholarships created by the Bausch & Lomb Optical Company.

The selection of scholarship winners is but the final stage in the yearly administration of the Bausch & Lomb Honorary Science Award and Scholarship program. Now in its eighteenth year, the program has been the source of about sixty-five thousand awards presented to high school seniors who have shown that they have outstanding abilities in the field of science. In addition, it has thus far provided financial assistance to thirty scholarship students at the University of Rochester. These services have given it the reputation of being one of the most widely recognized award-and-scholarship activities on the educational scene.

CONCEIVED in 1931 purely as an award program—with no thought of scholarships—the plan was presented to a group of science teachers and received their hearty endorsement. A medal, created by the eminent designer, Walter Dorwin Teague, was cast in bronze, and high schools throughout the country were alerted to its availability for presentation to graduating students with exceptional records in scientific subjects. Schools enrolled by the hundreds and today number about five thousand. Among the participants are fifty-six high schools in Puerto Rico, three in Alaska, seven in Canada, one in Cuba, one in Hawaii, and one in the Philippine Islands.

In schools where the Honorary Science Award program is in effect, articles in school papers and bulletin-board posters, supplied by Bausch & Lomb, announce the plan to students. To this curtain-raising—on a prize that many students consciously strive for during almost the whole of their four years in high school—science teachers, principals, and others add the support of official and semi-official encouragement. All this has the effect of generating an atmosphere of expectation among unusual students and of channeling academic effort toward scientific subjects. From a survey made by Bausch & Lomb in 1941 it was shown that the program, from the standpoint of stimulating interest in science, had surpassed the fondest hopes of its sponsors. Ninety-five percent of those replying to the questionnaire had received college training. Students stated time after time, that they were encouraged to pursue a scientific career because of the stimulus provided by the science medal they received on graduation from high school.

THE rules governing the presentation of awards state that they are available to "any

M. H. Eisenhart, President of Bausch and Lomb Optical Company and Chairman of the Board of Trustees, University of Rochester, congratulates James F. Glenn, one of the Bausch and Lomb scholarship winners.

high school or preparatory school offering three or more science subjects." The question of who is elected is entirely within the jurisdiction of the school, and in cases where two classes are graduated annually an award is presented to the outstanding science student in each class.

Operating on this basis, the Honorary Science Award program had become so thoroughly entrenched in many of the nation's schools, and seemed to be playing so significant a role as a motivating influence toward college concentration in science, that in 1944 Bausch & Lomb augmented the program with several annual scholarships at the University of Rochester. Eligible to compete for these scholarships are high school seniors who have received the award. *Provided*—and the provision is an important one—that they submit applications to the Director of Admissions at the University of Rochester on or before a specific date. Because applications have increased enormously since this phase of the program was begun, the deadline for 1950 has been advanced to March 10th.

A great many of the schools participating in the Honorary Science Award program have been confused in the past about the scholarship plan, and it is not unusual for the Director of Admissions, or Bausch & Lomb, to receive letters written after the closing date asking if students are still eligible for competition. In cases where the student's academic average and personal qualifications are unexceptional, this belatedness is not a serious

Continued on Page 43

Scholarship winners in front of University of Rochester's Rush Rhees Library.

Chats With Science Teachers—VIII

Your Students are Poets!

By HANOR A. WEBB

George Peabody College for Teachers
Nashville, Tennessee

Do you know whether your science classes include poets? You can certainly find out!

Spring comes this year on March 20 at precisely 11:36 P. M., Eastern Standard Time, and one hour earlier for each Time Zone westward. One of the many signs of spring is the rise of poetic fervor in the hearts of students, particularly in the high school. Even the children of the grades are not immune to the urge to write verse. Psychologists have a learned explanation involving a "seasonal glandular stimulation," but we teachers recognize it as one of the symptoms of Spring Fever.

If you have never invited student poetry before, you have a new spring experience in store!

SEVERAL years ago, when I was editor of *Current Science*, it was my custom to ask our nation-wide student-subscribers to contribute a Spring Poem Issue, published each May. (This gave our Northern contestants a chance to thaw out.) The response was overwhelming! Thousands of poems poured in upon me. Frankly, most of them were on a level of poetic mediocrity—but for each the effort had been worthwhile.

The fifty or more winners of small prizes and honorable mention, and the thirty to forty poems that could be published in one issue, were selected by certain criteria that seem to recognize both the art and the craft of writing poetry. If you really intend to carry out a Spring Poetry Contest in your science classes (and I hope you will!) here are suggestions—such as were made in the *Current Science* announcements—to guide the efforts. Discuss these before the writing begins; they will aid, not hinder, the youthful Muses.

1. Each poem should be about *Nature in the springtime.* Each must, of course, be original, and not copied from any previously published material.

2. A poem may win a prize because of its *excellent rhyme.* Here is an example of good rhyme:

March Passes

The winter winds are howling loud;
For stormy March with triumph reigns,
And veils beneath a snowy cloud
The leafless trees, the barren plains.
Yet soon appears the welcome sun
And drives the clouds and rain away.
The ice-bound rivers freely run,
The songster sweet renews her lay.
Then passes dreary March away,
For smiling Spring once more is here;
So vanishes the darkest day,
And brightest hopes and scenes appear.
—*Bernice Driggers*, Cheraw, S. C. (1938)

3. A poem may win a prize because of its *accurate rhythm.* This is an example of pleasing rhythm:

Togged Out for Easter

I walked along the avenue
  About a month ago,
And on that certain afternoon
  The trees were white with snow.
But yesterday I walked again
  Along that wooded way;
The trees were budding all anew,
  Prepared for Easter day.
—*Wilma Judah*, Bedford, Ind. (1937)

4. A poem may win a prize because of its *superior thought, pattern, or organization.* This illustrates a clear pattern:

Spring Senses

I can smell spring.
It smells good.
It smells cool and earthy.
I can feel spring.
It feels good.
It feels damp and soft.
I can hear spring.
It sounds good.
It sounds vibrant and alive.
I can see spring.
It looks good.
It looks green and vital.
—*Eunice Holm*, Grand Rapids, Mich. (1937)

5. A poem may win a prize because of a *vivid description.* Here is a challenge to the mind's eye and ear:

Formula for Spring

Now we all know that H_2O
Is the chemist's formula for water:
But did you know that the bluebird's call,
Refreshing showers that softly fall,
Marble playing and outdoor games,
Budding trees and old heart's flames,
Feverish housecleaning, raking, plowing,
Children with hoes, their heads all bowing,
Laughter and splash in the swimming pool,
The frog's loud croak that thrills your soul,
Is Nature's formula for spring?
—*Sara Ewart,* West Helena, Ark. (1939)

6. A poem may win a prize because of its *humor.* Read this aloud—and laugh!

Code Id Sprig

Sprig has cub
Ad od each twig
Are buds ad shoods
Thad tell of sprig.
My sprigtibe code
Is also here;
Id's id my head,
Ad dose, ad ear.
They say a lilag smeds quide sweed
I'be dever smed the thig—
Begause I'be adways had a code
On every siggle sprig!
—*Charlotte Butler,* Sullivan, Ill. (1937)

7. A poem may win a prize because it is *clever and unusual.* Isn't this "cute":

A Pasture Conversation

"Oh, look! I see a robin," said the chicken to the cow.
"It seems that 'Lady Spring' is here. What fun we will have now!"
"Oh, yes," replied Old Bossie, with a grin spread o'er her face.
She knew that grass would come with spring, and cover ev'ry place.
So Bossie rushed right through the gate, without a backward look.
She spied the old gray horse and bawled, "It's Spring in ev'ry nook!"
Then Dobbin whinnied loud his joy and stamped upon the ground,
"So Spring is here!" he loudly neighed and raced the pasture 'round.
Soon all the farmer's animals had heard the joyous thing;
Let's take a lesson from their glee, and welcome in the Spring!
—*Norma Payne,* Galesburg, Ill. (1939)

There are other criteria, of course—but no poem is expected to have them all at one time.

The poem's *idea* really comes first. This idea and its expression should not be trite—the bane of mediocrity in poetry. In 1938 the "Assistant Judge of Poetry" wrote:

Here is a statment from my heart:
I'll give a rousing cheer
For any poem that does not start—
Or end—with "Spring is here!"

A POEM should express an interesting thought. It should buoy your spirits up, not cast them down. You should be willing to read most poems a second time—or even more.

For students, writing poetry is a superior exercise in cultivating the understanding and the use of words. A poet must be a keen observer, to write his descriptive lines. He must be a concise thinker, for one line of poetry often tells as much as several lines of prose.

Are not skill in the use of words, keen observation, and concise thinking certain abilities of high value in our science classes?

I guarantee that you have poetic talent in your science classes. I challenge you to discover it, through the medium of Spring Poems. Although I no longer edit *Current Science,* I would be glad to receive copies of the best poems your students write, and tell you what I think of them.

CONSERVATION PUBLICATIONS

The following publications may be obtained from The National Committee on Policies in Conservation Education, 1409 Garfield Street, Laramie, Wyoming:

Proposals for Formulating National Policies; Report of the National Committee on Policies in Conservation Education; Some Selected References on Conservation for Pupils and Teachers, January 1, 1949; Report of the Workshop Conference; Some Selected References on Conservation for Pupils and Teachers. Revised Second Edition July 15, 1949; and *The Goal of the National Committee on Policies in Conservation Education.*

Science Clubs at Work

Edited by MARGARET E. PATTERSON
Secretary, Science Clubs of America

• A department devoted to the recognition of the splendid work being done by science club members and their sponsors. Material for this department, such as student made projects; demonstrations and posters; outstanding club programs; state and regional meeting announcements; should be sent to Miss Patterson, Science Clubs of America, 1719 N Street, N. W., Washington 6, D. C.

Fourth Annual Junior Scientists' Assembly

HERBERT S. ZIM
Director, 1949 Assembly

"Since most high school graduates are going to be human beings, it is important for them to learn science. A few are going to become scientists and it is equally important for them to learn to be human beings." This comment by Andrew Sessler, a member of the panel discussion set the pace of the Fourth Annual Junior Scientists Assembly. The panel of college students tackled the controversy between science and the humanities—a theme which turned up in many of the speeches and symposia at the concurrent meetings of the American Association for the Advancement of Science in New York (Dec. 26-31, 1949).

THE Junior Scientists Assembly was organized by the AAAS to bring together young people at the beginning of their scientific careers for mutual stimulation, and for introduction into the professional groups in which they hope and plan to participate. As the Junior Scientists Assembly meets with the AAAS at its meetings, the participants find opportunity to attend sectional meetings, addresses, symposia, field trips and exhibits. The preliminary informal get-togethers are opportunities for discussion about courses, research and individual plans. At formal meetings of the JSA, teachers, who make up a large part of the audience, have been quick to respond to the challenging comments of recent high school students on questions of science education. The response is usually a warm one.

In preparation for the 1949 meeting, invitations were sent out to the deans and principals of colleges and secondary schools asking them to nominate one (for high schools) or two (for colleges) participants. Invitations also went out to Science Talent Search winners who attend school or who reside in the vicinity of New York City. In response, 33 men and women were nominated from the college group; representing 16 colleges and universities. The private and public secondary schools were represented by fifty-six participants, all seniors.

THOUGH the meeting of the Junior Scientists Assembly was scheduled for the Grand Ballroom of the Hotel New Yorker at 3:30 on Thursday, December 29, the activities actually began in the morning when all members of the Assembly were invited to hear President Conant of Harvard address the New York Federation of Teachers on *Understanding Science as a Humanity*. They actually heard another Harvardian, Dr. Harlow Shapley who spoke for Dr. Conant who was ill. After this, the members of the panel had a meeting all their own to dissect the morning meeting and to expose their own views of the problems and the humanizing effects of science to one another. Following this heavy fare, all the participants assembled in the Coffee Shop for a Dutch-treat lunch. After this, some went to another meeting on science and general education, while others spent their time at the many exhibits set up by students of New York high schools.

Promptly at 3:30 Dr. Morris Meister,[1] as chairman of the AAAS committee on the JSA opened the Fourth Annual JSA and de-

1—Other members of the committee are: Mary Creager, John C. Hogg, Keith Johnson, Hugh G. Muldoon, Lucy Ornstein, Margaret E. Patterson, John W. Thomson, Jr., J. H. Ward, and Herbert S. Zim.

Dr. Zim summarizes the opinions of the twelve members of the panel after their discussion at the Fourth Annual Junior Scientists Assembly.

scribed the purposes briefly. He then turned the meeting over to Irving Yoskowitz (Harvard '53), the student Chairman for this year. From then on the meeting was in young, but capable, hands. The Chairman first introduced two secondary school speakers whose research projects were typical of the many exhibited that day and whose ability in tackling science problems was indicative of the high level at which science interested and talented young people can work.

Lisa Steiner, sixteen, of Forest Hills (N.Y.) High School, reported on her studies on *Some Effects of Radiation on Ascorbic Acid*. Robert Beck of the Bronx High School of Science gave an account of his work in the *Construction and Calibration of a Stroboscope for Experimentation with Model Airplane Engines.*

THE HIGH point of the meeting was the panel discussion on *Science and the Humanities*. The twelve members[2] of the panel lost no time in defining their terms and developing their point of view. Their concept of science was broader than that usually found in textbooks. Panel members included most knowledge obtained through sensory perception especially when the various scientific methods were involved. The panel conceived of the humanities as those fields of learning concerned with values and value choices. They recognized their definitions were not mutually exclusive, for as the panel put it, "science certainly is a humanity and the humanities may often be very scientific." In fact, the panel went on further to suggest that whole areas of the humanities might be advanced if relevant scientific methods could be developed for them.

Moving from rather philosophic definitions right down to the schools, panel members individually and collectively felt that there was little opportunity for science to function as a humanity in the present course. The emphasis on memorization of facts, repetition of hackneyed "experiments," and lack of opportunity to understand and use scientific methods all contribute to this deficiency. The

2 MEMBERS OF THE DISCUSSION PANEL—1949

Kenneth Collins, Brooklyn, N. Y., Electrical Engineering, Polytechnic Institute of Brooklyn, '51.

Irene Dale, Jersey City, N. J., Chemistry Education, New Jersey College for Women, '50.

*Madeline Levy, New York, N. Y., Endocrinology, University of Wisconsin, '49, Graduate School, N.Y.U.

Gordon M. Loos, Princeton, N. J., Biology, Princeton University, '50.

Rose Rudel, New York, N. Y., Chemistry, Hunter College, '50.

Richard Rutledge, Morristown, N. J., Physiology, Rutgers University, '50.

*Andrew M. Sessler, Jamaica, N. Y., Theoretical Physics, Harvard College, '49, Graduate School, Columbia University.

*Paul L. Shiman, Millburn, N. J., Physical Science, Yale University, '53.

Kathryn G. Spackman, Jr., West Chester, Pa., Chemistry, Vassar College, '50.

*Ursula Victor, Kew Gardens, N. Y., Bacteriology, Swarthmore College, '53.

Tristan Wooster, Ridgewood, N. J., Electronics, Stevens Institute of Technology, '51.

(H) Irving Yoskowitz, New York, N. Y., Biology, Harvard, '53.

*Science Talent Search Winner.

(H) Science Talent Search Honorable Mention.

panel called for a complete revaluation of science as it is now taught for general education purposes. They felt that the schools now lag far behind the scientific frontiers and that science education should reflect the broader viewpoint that scientists are now taking of their work and their role in society. To this end, Ursula Victor suggested the need for fusion between the social and natural sciences on the high school level, pointing out the place where such a unified study would illustrate the interactions between science and the people who use it.

THESE suggestions were followed by more specific points. In making these, panel members felt that science courses could not merely add to their present content, but had to sacrifice the teaching of facts to achieve more important scientific values. The technique of the case history or historical approach to science was felt to have worth for secondary schools as well as for colleges. One panel member believed that discoveries like Charles' law or Pasteur's findings should be followed till all their effects on life today were clear to the student. The logic and methods of science should be studied, said the panel, by actual example and use by students.

"Spare us any more talk about scientific methods in the first weeks of our courses, unless we have a chance to use those methods during the rest of the term" was the way that Paul Shiman (Yale '53) put it. Finally, panel members, all of whom had been active in extra curricular science activities, felt that here was the area where science teaching was at its best, and where they learned most about science as a humanity; i. e., as it affected man. More opportunities for extra curricular activities were felt to be of value, especially to the science talented student.

To emphasize this point, Andrew Sessler recalled how a group of high school science students became involved in soil testing during the war. In testing the soil from neighborhood victory gardens the students not only learned the science involved but became aware of the ways people used, or neglected to use, information which could be of direct benefit to them.

Pupils from the secondary schools contributed to the discussion at this point and among their suggestions, two stood out. First, that science education in high school should aim at helping all students understand the meaning of science and its uses, even if actual scientific experience had to be left as part of extra curricular activities for those interested. The second suggestion was that secondary education be extended another half year or year, and with this broader base, college specialization would be less narrowing and more effective.

The college panel countered with the strong assertion that projects were the best kind of general education in science and should not be left for the science-talented pupils only. They went further in hoping that a science-talented student should not be considered queer and cut off from the rest of the student body. Much good might come if students were not pigeon-holed into "major" fields and forced to specialize too early. In concluding, the panel stressed that science in secondary schools and colleges could not function as a humanity till students had more experience with science as it affects people. To this end, the panel urged more visits to laboratories and industries; more field trips; more contact with government, industry, and with labor to learn first hand how science affects our lives and how it creates problems by its impact on people.

A summarization of the panel discussion and further comments from the audience brought the meeting of the Junior Scientists Assembly to a close. But the ideas and suggestions engendered a whole series of minor discussions and arguments which were still going on when the waiters began rearranging the ballroom for the evening banquet.

PROJECT ACTIVITIES WANTED

Project material is wanted by Science Publications, Normal, Illinois, in the fields of biology, physics and general science. One or more projects may be submitted. For manuscripts accepted the amount paid will vary according to the material. Authors should write for information before submitting manuscripts.

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"Learning" Tours for Chemistry Students

CARROL C. HALL
Instructor in Chemistry
Springfield High School
Springfield, Illinois

LET'S NOT call them field trips anymore! Those out-of-school excursions should be designed for learning not for a school holiday.

As every experienced teacher knows, learning activities must be planned. Otherwise, they fail in doing the job they should. The same is true of so-called field trips. Usually they result in "fiascos" of the first order and fail to accomplish their purpose. They must be planned! The slant should be changed from "Field Trips" to "Learning Tours."

*President, Illinois Association of Chemistry Teachers, 1949.

Steps in Planning

The steps in planning the "out-of-school" learning tour are as follows:

1. Prior to the tour, the instructor goes over in detail with the host (be it museum, factory, water plant, etc.) what is desired in the way of learning. It is best to go over the grounds personally beforehand.
2. In class, before the tour, give the students some specific things to do while on the trip. This can be done in the form of preliminary discussion. Better yet, give each student some definite work to do (such as: filling in preplanned outline) while at the place being visited.
3. Do not plan to talk or have the guide talk during the entire tour. If possible allow some time for personal observing; then call the group together again for questions.
4. At school, after the tour, review the "learnings" by either a written report or class discussion.

Illustrations of Out-of-School Trip

IN MY community I am blessed with a number of fine places for the tours. For example, I usually take my second semester chemistry classes on a tour of the geology section of the Illinois State Museum.

Prior to the "learning tour" idea, I talked about the exhibits or a guide from the museum took over. There was much playing around and many could not see that which was being shown.

With the switch to the "learning tour" idea, much better results have been experienced.

Each student on the trip has a specific job to do while at the exhibit; then they are called together to see some special items, i. e., the minerals of Illinois.

Recently they have made up a job sheet. This consists of the list of common minerals from their text. (Modern Life Chemistry, Table 24, pp. 446.) Each student fills out the sheet during the "tour" of the collection. An additional column is added to the form given in the text. This gives opportunity for recording their observations. The heading of the job sheet is as follows:

COMMON MINERALS

Mineral Class	Common Name	Symbol or Formula	Observed	
			YES	NO

An In-School "Learning Tour"

BELIEVE it or not, a "learning tour" can be arranged right in your own classroom or laboratory. Here is how it can be done:

Many chemical compounds are mentioned in the reading matter of each high school text. Not all of these are worked with in the laboratory exercises. However, they are in stock.

Suppose that when studying sodium and potassium compounds that an exhibit of them is set up in the laboratory. Then, with previously-prepared check lists in hand, the students "tour" the laboratory and see first hand the chemicals about which they have been reading.

Check list for an "in-school" tour.

SODIUM AND POTASSIUM COMPOUNDS

Name of Compound	Formula	Color	Crystalline		Uses (from text)
			Yes	No	

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Q. What does a Filmguide do?

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Q. For what films are Filmguides available?

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DIRECTORS MEET

Continued from Page 17

of the U. S. Office of Education. This is a tract of wild land near Washington that is under the joint control of the NEA, the NSTA, and a few other groups. It is being developed for recreation and nature study, and should be a very attractive place in a few years.

The Fiftieth Anniversary of the Central Association of Science and Mathematics Teachers, occurring in 1950, was noted. Greetings to this organization in some tangible manner were proposed.

The activities of Mr. Stanley E. Williamson in promoting the recent Western meeting of NSTA at Corvallis, Oregon, were approved, and appreciation of his good management expressed.

THE chief topic of the later period of the meeting was the proposal to purchase *The Science Teacher* from its present owner, Mr. John C. Chiddix, of Normal, Illinois. Advantages to the Association in owning and operating its official journal were pointed out. There was much discussion as to the respective advantages of purchase from Mr. Chiddix or of launching an entirely new magazine. After all points had been considered, the Directors authorized the Magazine Advisory Board to negotiate with Mr. Chiddix as to price, terms of payment, and other details. A suggested contract, requested and received from the legal department of the NEA, was to serve as a guide.

(These negotiations are under way with the prospects favoring the purchase of *The Science Teacher* by NSTA, and its publication in six issues per volume under the supervision of the Executive Secretary, Mr. Robert H. Carleton, beginning with the issue of October, 1950.)

The second meeting of the officers and directors of NSTA, held in the Hotel New Yorker on Wednesday morning, December 28, was attended by twenty-three members and guests. A quorum of the directors was present. The entire morning was spent in discussing the details of proposed changes in the Constitution, By-Laws, and Governing Rules of the Association. These were presented by Mr. Norman R. D. Jones of Southwest High School, St. Louis, Missouri, who is chairman of a Committee on Revision of the Constitution. Certain revisions were tentatively accepted by the directors. However, they will study the entire problem further and take action at the St. Louis meeting next July. All changes, of course, must be submitted for vote by the membership.

(Summary prepared by Hanor A. Webb, Recording Secretary of NSTA.)

REVISION OF NSTA CONSTITUTION

In accordance with the requirements of the NSTA constitution, members of the Association are hereby notified that the Board of Directors, following all constitutional requirements, recommends that the NSTA constitution be amended to make operative, beginning with the membership year 1950-51, the following schedule of membership classes and annual dues:

A. Individual memberships: *active*, $3; *sustaining*, $6; *life*, $100, payable in one lump sum or in annual payments of not less than $10; *student*, $1.

B. Organizational memberships: *affiliated groups*, no dues; *libraries*, $3; *commercial or industrial institutions*, $25.

This recommendation will be submitted for vote by the membership in connection with the election of officers in April.

Robert H. Carleton,
Executive Secretary.

NEWS AND NOTES

Continued from Page 19

one's appreciation of the unity of the universe not only in space but in time.

Dr. Shapley's talk was followed by discussion from the floor on the question, How can we teach science as a humanity? The discussion was led by Paul Brandwein, Forest Hills (N. Y.) High School, and was summarized by Morris Meister. In his summary, Dr. Meister pointed out that in connection with the question under discussion, cognizance must be taken of the variation in potential of our students with respect to understanding and appreciation. For each student on his own level, Dr. Meister declared it is possible so to teach science as to make it effective as a humanity.

Third National Conference on Industry-

Continued on Page 36

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NEWS AND NOTES

Continued from Page 34

Science Teaching Relations. The conference was held in the Grand Ballroom of the New Yorker Hotel on Wednesday afternoon, December 28. Since Morris Meister, chairman of the NSTA Advisory Council on Industry-Science Teaching Relations, was a speaker at the Science Writers Awards luncheon, Philip G. Johnson presided at the conference.

In opening the conference, Dr. Johnson reviewed briefly the birth and development of the Council program from the mailing of the first evaluated material in 1945 through the launching of a packet service in 1946, to the holding of the first National Conference on industry sponsored educational materials for science teachers at Chicago in December of 1947. This first conference resulted in the establishment of the Advisory Council at Atlantic City in February, 1948. The second conference was held in Washington in December, 1948, and it was a joint project of the Advisory Council and the NSTA in a program of providing information to personnel in industry who were interested in developing materials which might reach science teachers and their pupils. The same joint sponsorship developed the Regional Conference in Pittsburgh in September, 1949, and the Third National Conference in New York. Dr. Johnson also mentioned that the Advisory Council was deeply interested in research projects which might bring answers to questions concerning: how teachers use industry sponsored materials, what type of materials are well adapted to school use, what areas are being neglected and might therefore constitute fruitful areas for industries to study, how teacher training might help future teachers to understand and use industry sponsored materials, and other problems. He indicated that the program would include reports on some of these projects.

Frank M. Surface, consultant for the Standard Oil Company of New Jersey, discussed the topic, "Bringing Industry and Science Education Closer Together." He stressed the importance of teaching science so that young people coming into industry shall

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demonstrate high devotion to personal integrity, an open mind to new ideas and techniques, a genuine understanding of scientific methods, and a sensitiveness to scientific attitudes. He indicated that the massing of many facts by students was oftentimes a hindrance to these qualities, which are very important to industrial leaders. He developed the idea that the teaching required to bring about such a product must include pupil participation in the handling and study of real materials such as are currently under study by industries. Dr. Surface expressed the thought that industries might help by distributing materials which could be handled, observed, and subjected to experimentation along with publications giving information about industrial processes and other activities.

Robert H. Carleton, executive secretary of the National Science Teachers Association, discussed the topic, "How Science Teachers Use the NSTA Packet Service." His report was based on findings that grew out of a research project of the Advisory Council in which more than 700 classroom teachers indicated how they had used materials which had been distributed in the Packet Service. In descending order of frequency, these uses were: 1) classroom reference use by pupils, 2) special pupil reports, and 3) information for the teacher, 4) supplement the text, 5) bulletin board displays, 6) library reference use, 7) assigned pupil reading, 8) motivate a unit, 9) science club activities, 10) vocational guidance.

His report included details concerning these uses, and he promised that a full report of the study would go to all industrial representatives who had registered their presence in the several National Conferences or through other individual conferences and correspondence.

Dr. John Read of Boston University discussed a research study which he and several of his graduate students are undertaking concerning the "Characteristics of Business-Sponsored Teaching Aids which Teachers Find Useful." His report indicated that while the findings of such studies may not be directly useful to teachers, they gave promise of the production of better and better materials for evaluation and distribution to schools.

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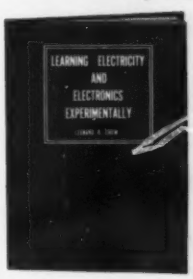

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The discussion from the floor brought forth many expressions of interest in the projects of the Advisory Council and a desire on the part of both educational and industrial leaders to see the projects and programs continue and expand.

Local arrangements for the meeting were ably handled by committees from the Federation of Science Teacher Associations of New York City. The joint banquet and the field trips were quite successful, and the display of science teaching demonstrations and students' projects was most interesting and instructive. Several exhibits were received from many parts of the country by the NSTA Committee on Apparatus and Equipment, Walter Lapp, chairman, and these formed an important contribution to the display.

People in NSTA

James R. Irving, for many years a chemistry teacher and chairman of the science department, Maine Township High School, Park Ridge, Illinois, has taken a new position with the Pure Oil Company. His new duties include training and personnel work with the technical staff and some editing of research reports. Mr. Irving has been and continues an active NSTA member. He and his chemistry students rendered consultative service last spring by "classroom testing" an industry-sponsored teaching kit which has now undergone refinement and is expected to be made available to NSTA members through the packet service.

Correction—when Maurice Ames became principal of Junior High School 118, New York City, last fall, Dr. Samuel Schenberg succeeded him as Senior High Supervisor of Science. Alfred D. Beck became Junior High School Supervisor several years ago and remains on this job. Apologies for the incorrect announcement in the December issue of *The Science Teacher*.

FELLOWSHIPS

The award of seventy six post-graduate and post-doctoral fellowships to forty seven universities for the 1950-51 academic year has been announced by the Du Pont Company. An authorization of $224,000 is provided for the awards.

CHROMOSOMES

Continued from Page 15

1. Place root tip in macerating fluid for 3 to 5 minutes.
2. Remove tips to the fixing agent for 2 minutes.
3. Now place tips in 70 per cent ethyl alcohol about 2 minutes to harden the tissues.
4. Place a small drop of acetocarmine on a clean glass slide and slice sections from the terminal millimeter of the root tip and push these into the stain.
5. Separate the cells further with the razor blade. The iron in the blade is needed to increase the intensity of the stain. Observe under the microscope and if the nuclei appear dark red the staining is complete.
6. Place a clean cover slip over the material and using a paper towel apply direct thumb pressure as previously directed.
7. Heat the slide over the flame from the alcohol lamp. Take care not to let preparation get so hot that it boils.
8. Examine the cells again under the microscope and if the proper differentiation has been obtained seal the edges of the cover slip with gum-mastic.

The temporary slides thus prepared may last for several weeks. The nuclear structures, except for color, stain in much the same way as already described for those stained with brilliant cresyl blue. Figure 5 shows something of the internal structure of the chromosomes after staining with acetocarmine.

The time required for making a temporary slide by either of the methods described should not exceed 15 minutes. With a few tries this time can be shortened.

Additional Suggestions

IN ADDITION to the simple methods for studying mitosis which have been described in this paper, technics have also been devised for the study of meiosis (reduction division). By somewhat more complicated and time consuming technics, the temporary slides prepared by the smear method can be made permanent. For more information on these technics, consult the items listed in the bibliography.

Continued on Page 48

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AUDIO-VISUAL

Continued from Page 23

in construction work were encouraged to design a water wheel from the top of a large sized food can. These boys also constructed a model dam and its topographic layout. These objects were carefully planned and constructed to scale.

CHILDREN are stimulated by what they see, hear, or read and a unit in *Nature Study* provides various opportunities for the young scientists to discover and define many problems. The only way the student's interest can be definitely aroused in nature study is for him to do things that will bring him in contact with nature. Pictures, nature stories, motion pictures, strip films, charts, posters, specimens, field trips, the radio, and television can be very successfully used to develop a great interest in nature study.

The newly developed animal slow-motion and stop-motion pictures of animals and other life-forms in their natural surroundings and normal activities can present to a class a much clearer and more accurate impression than can be obtained in any other way.

Our science classes have obtained a wealth of valuable information pertaining to our units from the "Have You Heard" series of radio programs and "This Wonderful World" series presented by the U. S. Office of Education, Washington, D. C. These broadcasts are fine examples of scientific information presented interestingly over the radio.

IN THE beginning classes of science this fall, our first project was to construct a museum in which the students displayed their nature study collections. It was initiated and built by the pupils themselves. They labeled and have on display such specimens as beehives, cocoons, rocks, meteorites, butterfly specimens, snake skins, and stuffed birds.

Several students brought to school large glass aquariums. One was filled with various kinds of small fish and the other was transformed into a terrarium. Now inhabiting the terrarium are various types of plants, small turtles, snakes, toads, and frogs.

Ample opportunity for contact with the study of animals and their habits has been provided. Three of the students constructed a pet cage of lumber and chicken wire. The children have been encouraged to bring in pets and birds to occupy this cage.

Members of the class have presented interesting oral talks on nature study materials and pictures they have obtained. They enjoy displaying many of their materials through the opaque projector and the use of this device tends to develop many class discussions and worthwhile questions.

GENERAL science in the junior high school is perhaps the most important science instruction given. In most cases it is the first formal instruction that is presented in science. Thus, its functions are both general and specialized.

From the above discussion, it is evident that there are available many audio-visual materials that serve to supplement the text material in the classroom.

All of these audio-visual aids tend to increase the knowledge learned and retained. Their frequent use stimulates interest in the subject, arouses the curiosity, and challenges the students to make discoveries for themselves. Only when this interest is present, does *learning* take place.

Audio-visual aids are not only devices for capturing and holding the interest of the student, but also are essential to efficient instruction. They become powerful teaching tools in the hands of a competent instructor.

FILMS

Your Editor has recently previewed several excellent films which should prove of interest to science teachers.

The United World Films, Inc., 1445 Park Avenue, New York 29, New York, has available a number of excellent films in the field of zoology. These films, especially designed to meet the demands of the modern curriculum in biology, were produced under the technical guidance of Dr. F. L. Fitzpatrick, Professor of Natural Sciences, Columbia University. Accurate and to the point, they provide thorough subject coverage in an absorbing, straightforward manner that consistently holds student interest.

The motion picture medium's independence

Continued on Page 42

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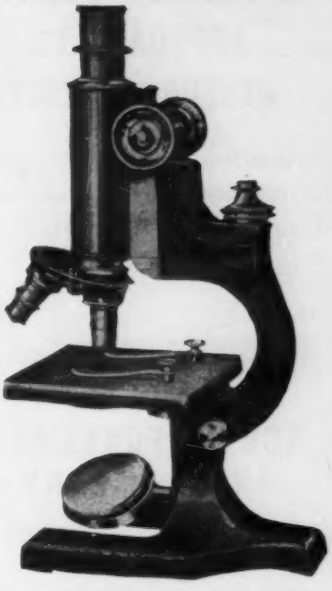

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FILMS

Continued from Page 40

of actual time enables growth processes and movements to be speeded up, and by means of close-up photography and microphotography, a detailed analysis of the structure and growth of living things may be made simultaneously by the entire class.

EARTHWORMS—one reel, black and white, length 10 min. Shows the earthworm's role in the aeration and enrichment of the soil. Under expert dissection, the muscular, circulatory, nervous, digestive and reproductive systems are delineated. The bisexual reproductive process is studied.

THE SEA URCHIN—one reel, black and white, length 10 min. Beautiful marine photography of the sea urchin and its close relative, the star-fish. Echinoderm life cycle; egg, sperm, segmentation, development of larva and metamorphosis into the young urchin, as compared with similar early development of the starfish.

CRAYFISH—one reel, black and white, length 10 min. This film first examines the crayfish in general terms, as an animal with an external skeleton. Moving on to specific details, it analyzes the function of the individual parts and explores the nature of the male and female reproductive systems. After this, the processes of feeding and digestion are considered. Then the arterial and nerve systems are seen and explained.

LIFE CYCLE OF A TROUT—one reel, black and white, length 10 min. Modern methods of speeded up photography enable us to follow smoothly the process of fertilization and the development of the germinal disc and yolk sac. We see the formation of the tail, head region, sense organs, gill clefts and vascular system. We penetrate into the structure of the embryo shortly before hatching and examine it in full detail.

Encyclopaedia Brittannica Films, Inc., 1150 Wilmette Avenue, Wilmette, Illinois, has produced a film entitled:

ALCOHOL AND THE HUMAN BODY—(14 min.) black and white. Sound. Shows the body's chemical reaction to alcohol, tracing the alcohol through the human system. Points

out the effects of alcohol on the body and shows some scenes concerning the problem drinker and his treatment in the hospital.

Coronet Instructional Films, 65 E. South Water St., Chicago, Ill., produced a sound film, black and white or color, length 10 min., entitled:

MECHANICS OF LIQUIDS—This film serves as an introduction to the field of hydraulics. The material is presented in semi-story form. Collaborator: Ira M. Freeman, Associate Professor of Physics, Rutgers University.

Eye Gate House, Inc., 330 W. 42nd Street, New York, New York, has available a series of colored filmstrips. These come in sets consisting of 250 frames. Film strip comes in full natural color. Titles in first series for the intermediate grades are:

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"About Our Earth"
"Our Earth Is Moving"
"Our Changing Earth"
"The Beginnings of Life"
"Animals of Long Ago"
"Man of Long Ago"
"Parts of a Flowering Plant"

The Society of Visual Education, Inc., 100 E. Ohio Street, Chicago, Illinois, has produced a filmstrip entitled:

AREAS BY INTEGRATION USING POLAR COORDINATES—Calculus is introduced to the beginning student in a series of simple illustrations prepared by Edwin A. Whitman, professor of Mathematics, Carnegie Institute of Technology, Pittsburgh, Pa. This is the fourth in a series of calculus strips.

—C. R. Crakes.

SCHOLARSHIPS

Continued from Page 25

matter, since the high calibre of the winners automatically rules out any but students with most exceptional abilities. But occasionally—more often than the Director of Admissions likes to see—a dilatory appeal describes a student who, by all odds, should be given a chance to compete. Usually, late entries cannot

Continued on Page 44

Science, in all its forms, has consequences, direct and powerful, for human society. Recognizing this, Silver Burdett science texts emphasize the social implications of science, organizing basic subject matter around problem areas having significance for young people in their everyday living.

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SCHOLARSHIPS

Continued from Page 43

be considered because finalists are selected soon after the closing date. The Director of Admissions therefore urges all schools to select award winners well in advance of the date set for the closing of the scholarship competition—*March 10th this year*—to notify them that they are eligible for the competition, to see that the proper forms are obtained from the University of Rochester, and to determine whether the forms have been filled out and returned in good time.

FROM the hundreds of students seeking to enter the competition this year, about fifteen or twenty will be earmarked by the University as promising candidates for the three Bausch & Lomb Scholarships now annually in effect. They will be brought to Rochester, entertained, taken on a conducted tour through the Bausch & Lomb plant, interviewed by the University, and tested. Three of them will receive scholarships, of a maximum value of $3,200, which will bring them, individually,

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SCHOLARSHIPS

eight hundred dollars a year for four years. (Originally, there were five scholarships with a maximum value of $1,500 each.)

Because of the unusual qualifications of everyone in the groups chosen thus far, it has been the University's policy to offer many non-winners scholarships sponsored from other sources, a practice which may well be repeated this year. The outcome generally can be expected to produce scholarships, of one kind or another, for many more of the students annually brought to Rochester.

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*Schools not now enrolled and wishing to participate in the Bausch & Lomb Honorary Science Award Program should write to: D. C. Flaherty, Secretary, Science Award Committee, Bausch & Lomb Optical Company, Rochester 2, New York.

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In Biology, Chemistry and General Science

Chemistry Projects

(Revised, 1947, Reprinted, 1949)

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Biology Projects

(Revised, 1948)

Included among these projects are: loss of soil elements by leaching, test tube plants and root hairs, food elements of plants, how to make a cross section of a stem, using light to make glucose and starch, when plants breathe like people, heat of respiration in plants, what causes liquids to flow in plants, identification of trees, the house fly and what he carries, controlling insect pests, digestion, checking your posture for health, charting your teeth, susceptibility to tooth decay, making media of correct pH to grow bacteria.

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General Science Projects

(Revised, 1950, Available August 15)

Among the projects are the following: amateur range finding, how to navigate by sun and stars, weighing without scales, making and using solutions, seven ways to start a fire, seven ways to put out a fire, chemical indicators, a rock mineral collection, a pin hole camera, printing pictures, learning to be a radio amateur, a pendulum project, testing foods at home, digesting food with saliva, canning food, how good are the arches in your feet, surveying the teeth, and clay modeling and casting.

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ELECTRONICS

Continued from Page 21

venient half-inch spacing between adjacent edges.

All plaques are drilled with a 2 in. square pattern of holes 3/8 in. in diameter. The number of these holes naturally depends on the size of the plaque. The existence of these holes in the plaques offers surprisingly little interference with the mounting of electronics components on their surface. The manner of hanging these plaques on the nail-studded assembly panel is illustrated in Fig. 2. Needless to say, the holes must be drilled with an accuracy which is difficult to achieve without the use of a drill-press.

Several typical examples of component parts mounted on plaques are shown in Figs. 3 through 5. It is possible to prepare these units with several useful kinds of improvements. For example, the tube-socket plaques (illustrated in December installment) have their pin connections color-coded according to the RMA Color Code.[1] This makes it possible to identify connections regardless of the orientation of the plaque, and at a considerable distance. Besides it provides valuable practice in learning the color code—a *must* for identifying the resistors so common in practical electronics work. Again, the large plaque for the transformer is equipped with a dummy surface raised above that of the plaque base far enough to clear the heads of the nails. This improves the appearance in general, and also provides added room for symbols. In this case the symbols are equipped with electrical connectors which are invisibly wired to the corresponding terminals of the transformer. This construction technique suggests a pattern for a whole series of deluxe plaques, each equipped with and wired to the appropriate symbol. Such units are extremely valuable for beginning students who have difficulty in associating actual components with their corresponding symbols.

1 The RMA (Radio Manufacturers' Association) Color code uses ten distinctive colors for the ten digits as follows:

black	—0	green	—5
brown	—1	blue	—6
red	—2	violet	—7
orange	—3	gray	—8
yellow	—4	white	—9

Book Shelf

BASIC TELEVISION. Bernard Grob, Instructor RCA Institutes. McGraw-Hill Book Co., New York, 1949. 596 pp. $5.00.

This book is written to present the basic principles of operation and servicing of television receivers to meet the increasingly large demand for a non-technical text. The author skillfully bridges the gap between engineering texts and simplified books, using no mathematics beyond simple algebra. The book is replete with diagrams, pictures and schematics, much of which the author has liberally drawn from RCA literature. Each chapter is followed by a number of review questions which are pertinent to an understanding of the principles and problems treated therein.—J. S.

AUDIO-VISUAL HANDBOOK, 6th Edition. Ellsworth C. Dent. Published by Society for Visual Education, Inc., Chicago. 220 pp. illus. $3.50.

This handbook is a practical guide to the selection and use of audio-visual materials. It discusses impartially the various audio-visual aids to instruction—their merits, in which circumstances they may be employed, and how to organize audio-visual centers in schools. Also, it contains a list of sources of equipment, materials and other important information. These features and others of the enlarged 6th edition will appeal to school administrators, visual coordinators, teachers in service, teachers in training and others interested in audio-visual material.

The author is well qualified with wide experience in the audio-visual field. He is to be commended for his efficient organization of sources of information and for the clear, concise, non-technical language in which the book is written.

PEACE OR PESTILENCE. Theodor Rosebury, Associate Professor of Bacteriology, College of Physicians and Surgeons, Columbia University. Whittlesey House, New York, 1949. 218 pp. $2.75.

The public has been so thoroughly nourished on the fiction of atomic bomb secrets that, even today, when much information has been made public, there is still a prevalence of lack of understanding of what the real secrets are. Dr. Rosebury believes that biological warfare is a very important potent factor in modern warfare. He points out that weapons control is not the solution of our peace problem. It is basically a political problem. Dr. Rosebury says, "If we could approach the international conference table with the respect for others that would grow out of true faith in ourselves, we might find a solution to the problem of peace. I do not think we have tried this yet, and I know of no experiment that promises so much." Dr. Rosebury, who was one of the key instigators of our own government's wartime research in this field, and was chief of the Air-Borne Infection project at the Camp Detrick, Maryland Headquarters, gives the reader an authoritative account of the whole technical field.

GOETHE AS A SCIENTIST. Rudolf Magnus. Henry Schuman, New York, 1949. 259 pp. 15 x 21.5 cm. $3.50.

In *Goethe as a Scientist* by Rudolf Magnus, translated by Heinz Norden, the whole scientific aspect of Goethe's many-sided personality is presented to the English speaking world. His experiments and discoveries in the fields of comparative anatomy, morphology, light and color are fully described. With skill and insight, Magnus takes us over the scientific ground covered by Goethe, brilliantly recreating the background against which Goethe's scientific works must be seen to be properly appreciated.

Goethe's vision of nature was one of unity, as he himself was a whole man—Leonardo is the inevitable comparison—and one of the outstanding contributions Magnus makes in this truly great study, written more than a generation ago and long regarded as indispensable to a complete understanding of the great German's mind, is that he focuses on this integration. He shows how Goethe's science was present in his creative work and how his scientific treatises were suffused with creative imagination.

Here is a work of interest not only to those concerned with science and the relationship between science and literature, but to the general reader who wishes to increase his knowledge of this immortal figure.

FRANCIS BACON—PHILOSOPHER OF INDUSTRIAL SCIENCE. Benjamin Farrington. Henry Schuman, New York, 1949. 14.5 x 21.5 cm. $3.50.

One of the first men of all history to grasp the revolutionary possibilities of man's increasing control over natural forces was Francis Bacon. It was in 1620 that he first set forth these views. The material progress of man depends upon his intellectual progress and both must go forward together. Today, little more than three hundred years after Bacon sounded this warning note, man is coming within a measurable distance of exhausting the resources of his planet.

The problem of how to restore this loss and retrieve our squandered treasure is a very pressing one, and it becomes evident that the study of such works as Benjamin Farrington's *Francis Bacon—Philosopher of Industrial Science* can help to give us a much needed perspective in our search for the solution. Bacon's plan for the total reform of society by the application of science to production was the central theme of his life and is the central theme of this new study of his career. The author presents Bacon as a man consumed with humanitarian as well as intellectual zeal, and the book ably serves to caution us that science will not avail mankind without the will to apply it unselfishly to the problems of human life.

HEREDITY—EAST AND WEST—LYSENKO AND WORLD SCIENCE. Julian Huxley. Henry Schuman, New York, 1949. 14.5 x 21.5 cm. $3.00.

Why has Trofim Lysenko, the Russian geneticist, become the storm center of the scientific—and political—world? Why have scientists outside the Iron Curtain so fiercely attacked the Soviet Union for adopting Lysenkoism as official, party-line genetics?

Now in his new book, *Heredity—East and West*, Dr. Huxley performs the invaluable service of explaining the conflict between Mendelian and Lysenkoistic genetics in terms which can be easily understood by the non-scientific reader. With great clarity he explores the scientific, social, and political aspects of the controversy from its earliest days to its culmination in the official banning of Mendelism in the U.S.S.R. in the summer of 1948. Not only has he carefully examined every inch of this ground, but he has had the unusual opportunity of talking with Lysenko and is thus particularly well equipped to give a clear analysis of the Russian's specific claims.

News and Announcements

EARTH SCIENCE CONFERENCE

A conference on the Teaching of the Earth Sciences in the Secondary Schools will be held at Boston University on Friday and Saturday, March 17 and 18, 1950. It will be open to all interested persons.

Among the topics to be discussed at the Conference are: a survey of earth science education at secondary school level; the scope of curriculum in the secondary schools; necessary teaching aids and laboratory equipment; and the preparation of teachers.

A number of educational institutions and publishing houses will hold exhibits at the Conference. Complete information and material on the Conference will be sent to those persons addressing requests to the Executive Secretary, The Earth Science Institute, Revere, Massachusetts.

NSTA NOMINATIONS

The nominating committee of NSTA would like for the members to send in suggestions for the officers and board of directors for the coming year. The persons suggested should be the leaders of their profession in the local community. They should be distributed geographically and be distributed in the various grade levels of science. Suggested names should be sent to Elmer Headlee, Chairman of the Nominating Committee, 221 E. Argonne, Kirkwood 22, Missouri.

GRANTS-IN-AID

The Du Pont Company has announced that it has authorized, for the second year, $100,000 for grants-in-aid to universities to "stockpile" knowledge through the advancement of fundamental science. The grants are for the 1950-51 academic year. They provide $10,000 for each of ten universities, all of which received similar awards from the company for the present school year. In this program, the universities themselves select the research projects for which the grants will be used.

MANUAL FOR FORESTRY

More than twenty years of research in handling seed for reforestation work has gone into the publication of "Woody-Plant Seed Manual," a 416-page, illustrated book just issued by the Forest Service, U. S. Department of Agriculture. This volume, foresters say, will be the definite authority on the production of seed for forest trees and shrubs. Included in the book are 444 species useful for forest plantings, form woodlot plantings, shelter belts, and as cover for wildlife. "Woody-Plant Seed Manual" is the cooperative work of hundreds of foresters and forest research men. Although more than 400 published articles were drawn upon, the manual is based largely on material never published before. It is issued as Miscellaneous Publication No. 654, and may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a price of $2.75.

ILLINOIS CHEMISTRY TEACHERS

Illinois Chemistry Teachers are planning the following meetings, according to their president, Carroll C. Hall of Springfield, Ill.

Friday, April 22. Morning field trip to industries in Mattoon. Lunch at Eastern State College, Charleston. Afternoon program and trip through new science building at EISC, followed by a State Geological Survey field trip the next day (April 23) starting from Shelbyville.

Saturday, October 28. Northwestern University, Evanston. Inspection of new science facilities during morning, lunch on campus at noon, and program in chemistry department in afternoon.

CHROMOSOMES *Continued from Page 39*

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2. Stewart, W. N. and A. M. Schertiger, 1949. Brilliant Cresyl Blue as a Stain for Plant Chromosomes. *Stain Technology*, Vol. 24, 39-45.

From the LIPPINCOTT Science List . . .

Biology for You—Revised by Vance and Miller

An up-to-date, 1950 edition of this widely popular high school biology text.

Biology Activities by Vance, Barker, and Miller

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Chemistry for the New Age by Carleton and Carpenter

A basal high school chemistry text written especially for high school students of today.

Physics for the New Age by Carleton and Williams

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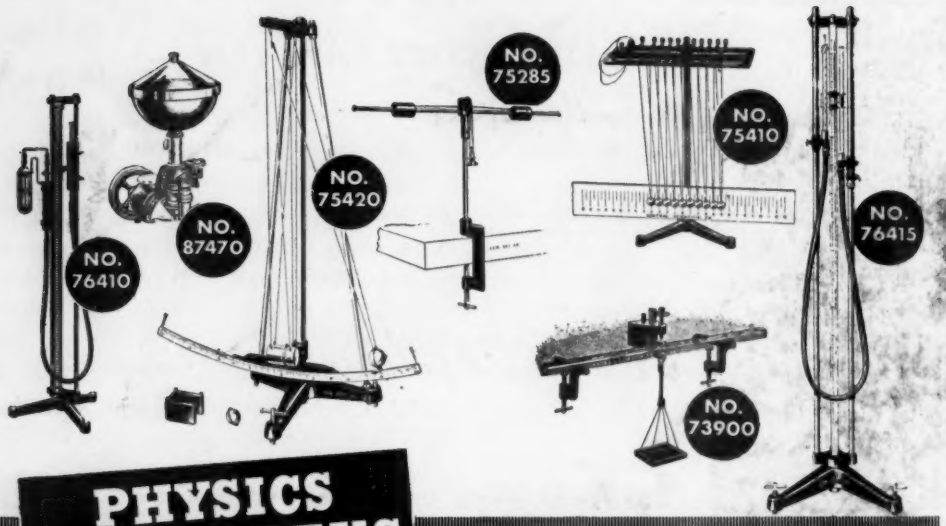

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